Global Precipitation (Means and Variations): GPM, TRMM and GPCP

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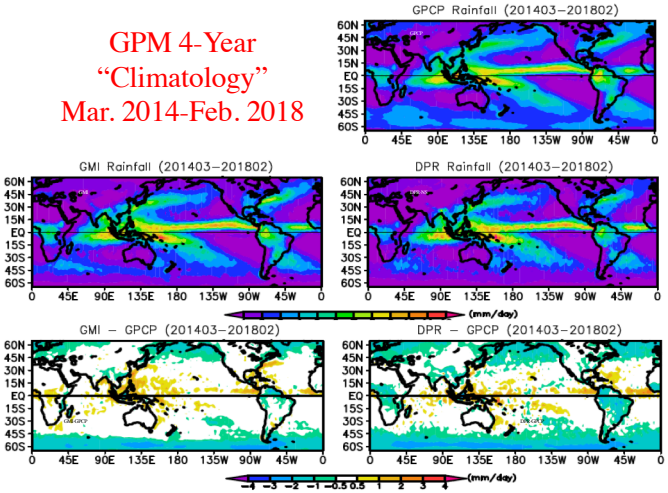
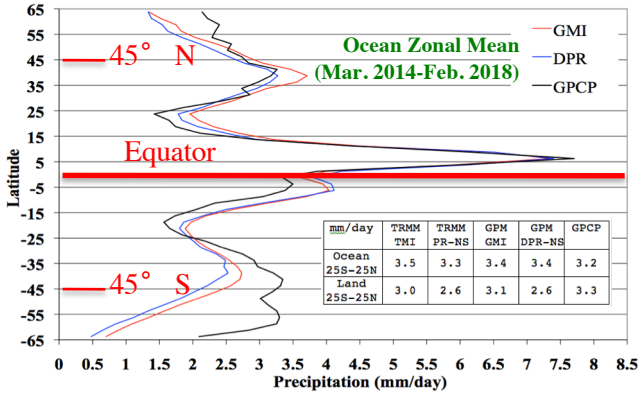
Objectives

- ***Develop a Composite Climatology using multiple products (PMW, Radar, Combined) from TRMM and GPM***
- ***Understand tropical rainfall-temperature relations with PMW and Radar observations to validate inter-annual and trend relations in GPCP and climate models***

GPM 4-Year "Climatology" Mar. 2014-Feb. 2018





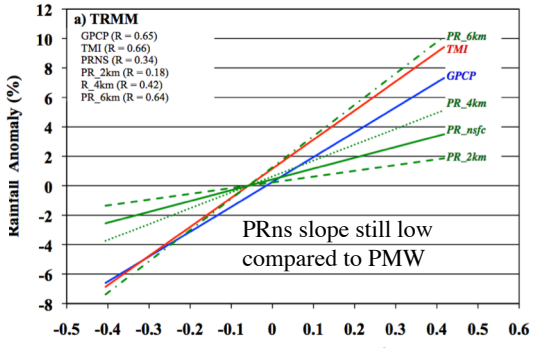
mm/day	TRMM TMI	TRMM PR-NS	GPM GMI	GPM DPR-NS	GPCP
Ocean 25S-25N	3.5	3.3	3.4	3.4	3.2
Land 25S-25N	3.0	2.6	3.1	2.6	3.3

GPM and TRMM somewhat higher than GPCP in tropical ocean, but lower over land, with PR/DPR very low

At high latitudes (>50 °) GPM lower than GPCP and CloudSat

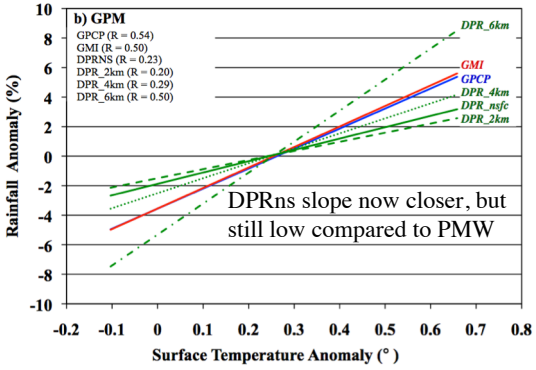
Slopes of TRMM-based Monthly Sfc. Temp.-Rainfall Relations (Radar vs. Passive Microwave)

1998-2013 (Ocean, 25 ° S-25 °N)

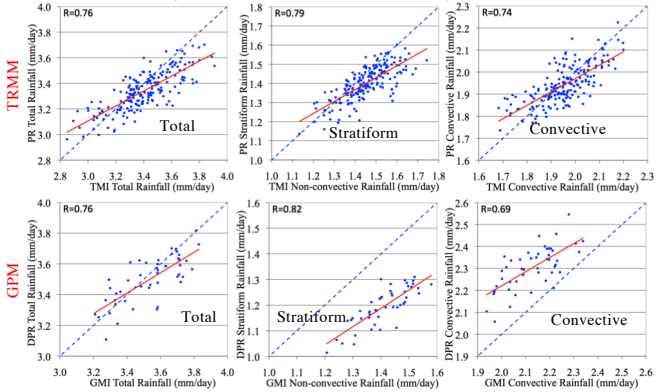


Slopes of GPM-based Monthly Sfc. Temp.-Rainfall Relations (Radar vs. Passive Microwave)

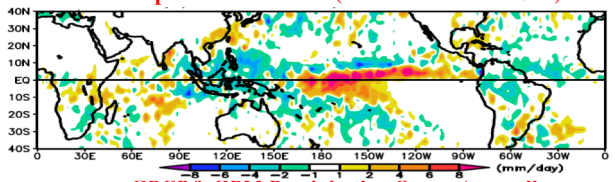
Mar. 2014-Feb. 2018 (Ocean, 25 ° S-25 °N)



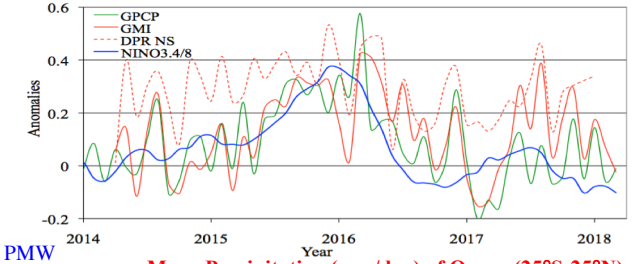
Inter-annual Variation of Ocean (25° S-25°N) Tropical Rain (Active vs. Passive Microwave)



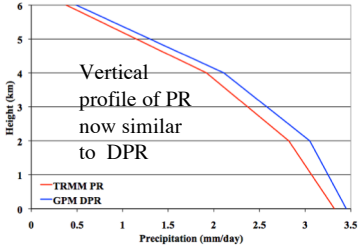
DPR Precipitation Anomalies (201511-201601 El Nino)



GPCP& GPM Precipitation Ocean Anomalies (against TRMM mean) (25°S-25°N) vs. Nino3.4



Mean Precipitation (mm/day) of Ocean (25°S-25°N) during Mar.-Aug. 2014 (TRMM/GPM Overlap)



Summary

- Over tropical oceans TRMM and GPM mean estimates (both PMW and Radar) slightly higher (~ 6-8%) than GPCP.
- Over tropical land TRMM and GPM low compared to GPCP (with gauges), especially the Radar estimates (not acceptable).
- Over high latitude oceans GPM-based mean estimates are low compared to GPCP and CloudSat-based estimates.
- GPM radar results for 2014-2018 (including El Nino) better agree with surface temperature – rainfall relations as compared to PMW results (including GPCP). TRMM radar results in this regard still show weaker relation, but now closer to DPR results.
- Convective-stratiform differences between TRMM PR and GPM DPR troubling.
- Developing a TRMM/GPM Composite Climatology (multiple products) hampered by unrealistic low radar estimates over land, weaker response to ENSO by radars, and lack of Combined product.